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American Cinematographer

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South Sea Island Scene in American Samoa. Still photographed by Fred H Parrish, A. S. C., and reproduced from Location Library of American Society of Cinematographers, Hollywood

THIS MONTH:

A Pneumatic Film Squeegee—By J. I. Crabtree and C. E. Ives; Amateur Cinematography: A Professional's Notes for Amateurs—By Joseph A. Dubray, A.S.C.

Vol. VIII JULY, 1927 No. 4

American Cinematographer

FOSTER GOSS, *Editor and General Manager*

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An educational and instructive publication, espousing progress and art in motion picture photography.
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The EDITOR'S LENS focused by FOSTER GOSS

EFFORTS AT ECONOMY

THAT a strategic blunder was committed in attempting to impose the reduction in studio salaries recently is the opinion that has slowly but surely crystallized among all those concerned with the contemplated cut.

¶ Meanwhile, until August first, the proposed decrease in salary is deferred; and those who should know claim that it will not be enforced.

¶ The crux of the cut was purported economy in film production. That such economy is desired and needed, no one doubts. But whether it can be achieved through reduction of salaries is extremely doubtful.

¶ The play on the salary situation cast its shadow some time in advance, if the events of the past several months are reviewed. In some studio quarters the cue revealed itself in comic opera fashion through the medium of high-pressure "pep" meetings; promulgation of doctrines of executive arrogance; and flattering, if official, slaps on the back for fair-haired employes. In addition, the program had its way paved by a certain corner of the trade press, which now has resorted to a precarious position on the fence, with its attitude divided between utterances of justification and attempting to prognosticate just what side of the hedge will be safer to land on, after August first. Added to these songs and dances there has been an obligato of vague allusions that relentless Wall Streeters had decreed that the fickle film people were being paid too much for good substantial Americans—which should be sure-fire stuff to bring forth the plaudits of those suffering thousands who may be pestered with that ogre, the inferiority complex.

¶ So with sober faces, sanctified enunciations of the tenets of higher "economics," and the atmosphere of churchly music, the cut was ushered in. Master showmen, learned in all the ways, impulses and reactions of human nature, called in the employes of their studios, and of course, sent they away happy in the divine thought that their wages were going to be cut. Naturally, they were at once converted into grateful, conscientious, serious and economizing workmen!

¶ No one denies that there are some salaries which are out of proportion to that which their recipients contribute toward the making of a motion picture. On the other hand, the equation is over-balanced by the wages of the many who are underpaid, in ratio to what they give in production of a picture. Such people as these have a right to expect a raise in salaries rather than a decrease.

¶ The most logical way to achieve economy in the film industry is not by making its faithful workers dissatisfied, but by routing that omnipotent bugaboo —true economic waste. Perhaps this heralded economy would not have been necessary if the thousands of dollars had not been poured in the sump hole of bad judgment that is represented by any one of a half dozen million-dollar-plus photoplays which can be named by any one who is at all familiar with the picture business. While these productions serve as outstanding examples, there are phases of practically every feature wherein real economy can be effected. Sets built at the cost of hundreds of dollars and never used, ill-picked locations whose chief virtues are unnecessary expense, thousands of feet of excess footage unintelligently directed; pictures begun and shelved forever because there was never a chance for them to be marketable—these are but a few items; if executives do not know others, let them confer with the men and women who are performing the physical tasks of making their films.

¶ Where salary reductions would save in units of tens, elimination of the foregoing factors would save by hundreds and thousands. And these factors can be detected and pruned within the studios themselves, without the aid of the stupid methods of self-important "efficiency experts" from the East.

¶ The greatest good can be done by the greatest number by the definite abandonment of the idea of unwarranted decreases in wages. It is unsound, not only economically, but as an effort at general discipline. Moreover, the notoriety attendant on such dodges, boomerangs just as injuriously as the old stories of inflated salaries of stars.

* * *

SPLENDID WORK

THOSE who enthused on the types of photography exemplified in "Variety," "The Last Laugh" and other German productions, will do well to inspect the work of Victor Milner, chief cinematographer in Paramount's "The Way of All Flesh," starring Emil Jannings. Milner's creations are not only a triumph for himself, but serve to demonstrate the mastery of the American cinematographer over any type of motion photography conceivable to direction, acting or scenario writing.

¶ As a contrast to the heaviness of the Jannings film, consult the manner in which the beautiful love theme of "Seventh Heaven" was handled photographically by Ernest Palmer, another member of the American Society of Cinematographers. Palmer has many notable productions to his credit, but it is universally admitted that this is his masterpiece.

Camera Experiments Bring Film Economy

Private Research by Cinematographers Saves Thousands in Production Costs Each Year

(The following interview, written by the editor of this publication, appears in the current Studio Section of Exhibitors Herald.)

Experiments conducted by individual cinematographers cost hundreds of dollars each year, but result in cinematographic improvements which save motion picture producers thousands per annum, according to a statement by Daniel B. Clark, president of the American Society of Cinematographers.

"Practically every cinematographer of note," Clarke reveals, "spends much of his own leisure time in experimenting along various lines in cinematography. Many of them have small experimental laboratories and private work rooms, equipped with precision instruments and machinery wherein they pass hours working out improved methods and machinery for motion photography. Hans Koenekamp, Max Dupont and Joseph A. Dubray are among the A. S. C. members whom I might mention offhand as maintaining equipment of this sort.

"Such activities, it can easily be seen, means a substantial investment to an individual, not only for the outfitting of such establishments but for the materials used in experiments, not to mention the fact that no reward is at hand for the time consumed in such work. Many other cinematographers, who do not maintain their own little laboratories, have special arrangements with precision mechanics for the execution of whatever improvements they work out in their camera instruments.

"Speaking of these improvements," Clark continued "there is little or no effort on the part of the rank and file of cinematographers to capitalize on the fruits of their ingenuity. What they work out is applied on first opportunity in their next production; and, at meetings of the American Society of Cinematographers, one of the prime purposes of which is the exchange of ideas, these new wrinkles are explained and passed on to fellow cinematographers, who, in turn, are enabled to incorporate them in their own productions.

"It is therefore readily evident how the efforts of a single cinematographer are carried on to the benefit of the industry generally, with the resultant saving of thousands of dollars each year in production costs. Practically every cinematographer, in his way, contributes something toward the general cause. For the cinematographer, there is no personal recompense—and, in fact, very little credit—for these silent professional endeavors of his. There is no increase in his salary, even when they are applied in his own productions; and no one, with the exception of fellow cinematographers, even thinks of the originator of such improvements when they are taken advantage of at other studios. But it is this high professional spirit, coupled with self-effacement, that has made possible the progress of the industry through the steady and phenomenal advances of cinematography."

John W. Boyle, A.S.C., Signed As Sennett Camera Chief

John W. Boyle, first vice president of the American Society of Cinematographers, has signed a contract to become chief cinematographer at the Mack Sennett studios where he has already begun his new duties.

Boyle's last production was "Topsy and Eva," starring the Duncan Sisters for United Artists. He has been affiliated with the most prominent producing organizations in the business, and has been a ranking cinematographer since the pioneer days of the industry in New York City.

Lecture on Color Carbons Given at A. S. C. Meeting

Charles W. Handley, of the National Carbon Company, was the principal speaker of the evening at the open meeting of the American Society of Cinematographers held June 27, in the A. S. C. assembly rooms, Hollywood.

Mr. Handley spoke on color carbons. Guests of the meeting included Fred McBan and Glen Gano of Creco, Inc., and Paul Allen.

Arrangements for the meeting were in charge of Victor Milner, A. S. C.

A. S. C. members are seldom available; when they are, they may be reached through the A. S. C. offices—GRanite 4274.

A Pneumatic Film Squeegee

By J. I. Crabtree and C. E. Ives

Apparatus Outlined for Removing Excess Moisture After Washing, Before Drying

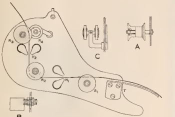


Figure 1

Figure 2

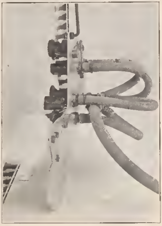


Figure 3

(Communication No. 305 from Research Laboratory, Eastman Kodak Company, Rochester, N. Y.)

It is very necessary to remove all excess moisture from motion picture film after washing and before drying in order to prevent the possible formation of markings during drying.[1] This is especially true if the gelatin coating of the film is abnormally swollen, which condition may exist in warm weather if the processing solutions are not kept at normal temperature, or if the film is insufficiently hardened either before or during fixation.

When developing motion picture film by the rack system it is customary to wipe the film with absorbent cotton, chamois, or sponge during transference to the drying reel,[2] but this involves the expenditure of a considerable amount of labor and the gelatin coating of the film is liable to be scratched unless great care is exercised in the wiping process.

Excess Moisture

The most satisfactory method of removing excess moisture from the film after washing is to impinge a blast of air on both sides of the film. Pneumatic squeegees for accomplishing this are in general use on processing machines but they have not been adopted by laboratories using the rack and tank system of development, owing o the non-adaptability of the conventional squeegee for this purpose.

A simple air squeegee having a single pair of air nozzles was first constructed and this produced good results, but it did not permit of leading the film on the drying reels sufficiently rapidly. The apparatus was modified by adding a second pair of nozzles working at right angles to the first set and at a distance of about six inches away which permitted the film to travel at twice the speed.

Plan of Apparatus

A plan of the apparatus is shown in Fig. 1. The wet film first passes over a short wiping table T, over which a wad of wetted absorbent cotton wrapped around the

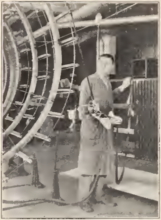


Figure 4

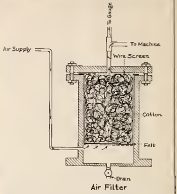


Figure 5

film is held so as to loosen any dirt adhering to the film. After passing over the idler roller R_1 the film passes between the first pair of air nozzles N_1, over roller R_2 and between the second pair of nozzles N_2 and then over roller R_3 to the drying reel. Rollers R_1, R_2 and R_3 are necessary in order to keep the film taut between the nozzles, otherwise any variation in the air pressure on the two sides causes the film to vibrate so that there is danger of the gelatin coating touching the nozzles, which would produce scratches. The roller R_4 consists of two narrow soft rubber discs bearing on the perforations and held down by a light tension spring. This prevents the film jumping off the roller or backing down when threading the machine. It is convenient to turn on the air pressure by means of a trigger, otherwise, the air flow interferes with the threading.

Rollers R_1, R_2 and R_3 are shown in section at A, Fig. 1. The emulsion side of the film is in contact with rollers R_2 and R_4 but only over the perforation area. A section of the nozzles N_1 and N_2 is shown at B and of the roller R_4 at C. A photographic elevation of the squeegee is shown in Figs. 2 and 3.

The rollers and air nozzles are assembled on an aluminum plate in the relative positions shown in Fig. 1, which is drawn to scale.

The Air Nozzles

Careful adjustment of the air nozzles is necessary to insure efficient removal of the water. An angle of inclination of about 40° to the film was found satisfactory with a 1-32" slit, an air pressure of 20 to 30 pounds per square inch, and a separation of 1-8" between the nozzles and the film.

Air is supplied to the nozzles by means of a four-way junction from a main supply distributed through pressure rubber tubing (Fig. 3.) A pressure regulator should be inserted in the air line so as to insure uniform performance of the squeegee.

Manipulation of Squeegee

Although it is possible to hold the squeegee before the drying reel if two persons are employed for the film transfer, it was found preferable to suspend the apparatus from a pulley traveling along a wire cable stretched in front of the drying reels as shown in Fig. 4, which clearly indicates the method of use. It is necessary to maintain a free loop of film between the rack and the squeegee and to maintain a constant speed of rotation of the drying reel during leading, which must be slower than during drying. With two persons employed for loading the reel speed can be regulated by hand, but with one operative it is necessary to control the speed of the reel by means of a foot brake. The precise braking mechanism required depends on the nature of the reel drive. Usually a band brake fitting over a drum attached to the reel axle and actuated by a foot level will suffice. The operator must unwind the film rack, progress the squeegee along the drying reel, and control the drying reel speed simultaneously, but this can be accomplished with a little practice.

(Continued on Page 16)

In Camerafornia . . .

and News Notes of the Month

E. B. DU PAR, A. S. C., has finished his cinematography on Sid Chaplin's last starring vehicle for Warner Brothers. The cast includes Helene Costello, Clara Horton and Duke Martin.

Du Par is in charge of the filming of Vitaphone features at the newly erected Vitaphone studio at the Warner Bros. Hollywood plant, and shortly will begin the filming of "The Jazz Singer," starring Al Jolson. He has already made a number of preliminary subjects at the new studio.

The A. S. C. member has been experimenting with Mazda lighting and has been using nothing but panchromatic film for the Vitaphone numbers. Du Par's investigations reveal, he says, that much better results are derived from this combination than from straight stock and arc lights. Among the advantages are the absence of noise from the light source; better pictorial values, and, according to figures kept by the A. S. C. member and Frank Murphy, Warners' electrical chief, the saving of approximately 60 per cent in electrical costs.

* * *

E. Burton Steene, A. S. C., has put in another busy month in his activities as an Akeley camera specialist. Following a location trip to San Francisco, Steene did the Akeley work in First National's "The Drop Kick," starring Richard Barthelmess, after which he returned to the Paramount studios to preside similarly in the filming of "The Gentleman from Paris," starring Adolphe Menjou.

* * *

Walter Griffin, A. S. C., is filming the latest Duke Worne feature.

* * *

Dan Clark, A. S. C., returned from location at Prescott, Arizona, during the past month, only to depart almost immediately for Merced County, California, for another location journey for the latest Tom Mix feature.

* * *

Tony Gaudio, A. S. C., is chief cinematographer for Douglas Fairbanks' "The Gaucho," now in production at United Artists studio.

* * *

Charles Rosher, A. S. C. is photographing Mary Pickford's "My Best Girl.

Gilbert Warrenton, A. S. C., is filming "A Man's Past," starring Conrad Veidt at Universal. George Melford is directing.

* * *

Charles Clarke, A. S. C., is shooting "Ham and Eggs," which Roy Del Ruth is directing for Warner Brothers.

* * *

John F. Seitz, A. S. C., is finding current Southern California weather inconsistent with the theme of his cinematography in Metro-Goldwyn-Mayer's "The Trail of '98," which has to do with the gold rush days in the frozen Alaskan wastes.

* * *

Reginald Lyons, A. S. C., is shooting "Chained Lightning," starring Buck Jones, for Fox.

* * *

George Schneiderman, A. S. C., is photographing Fox' "Two Girls Wanted," starring Janet Gaynor. Al Green is directing

* * *

King Gray, A. S. C., is shooting "Why Blondes Leave Home" at the Fox studios.

* * *

Nicholas Musuraca, A. S. C., is filming F. B. O.'s "South Sea Love," starring Patsy Ruth Miller and directed by Ralph Ince.

* * *

Charles Van Enger, A. S. C., is photographing First National's "The Life of Riley," featuring Charlie Murray and George Sidney. William Beaudine is directing.

* * *

Arthur Edeson, A. S. C., is in charge of the cinematography on "The Drop Kick," a First National production starring Richard Barthelmess. Millard Webb is directing.

* * *

Sol Polito, A. S. C., is shooting "Hard-Boiled Haggarty," starring Milton Sills, for First National. The story is one of aviation during the World War. Charles Brabin is directing

Amateur Cinematography

A Professional's Notes for Amateurs

Part IX
By Jos. A. Dubray A. S. C.

Convergent and Divergent Lenses; Points and Planes; and Other Data Considered

(Continued From Last Month)

J. A. Dubray

It is a well known fact that if a convergent lens is placed facing the sun, a certain position will be found at which a small and extremely brilliant spot will be seen at a certain distance from the lens. Furthermore, if the hand is placed at this distance from the lens so that the brilliant spot rests upon it, an impression of heat is immediately felt, which becomes rapidly unbearable for its intensity. If the spot is made to fall upon some quite inflammable material, such as paper, dry straw, cotton, etc., a relatively short exposure to its heat is sufficient to ignite the material.

This point of extreme maximum heat, is called the *"focus"* of the lens. Focus, is from the Latin word *focus*, which means "fire."

Let us consider a bi-convex lens as in Fig. 20.

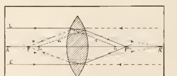


Figure 20

The rays emanating from the sun and incident to the first surface of the lens, may be considered as being *parallel to the axis of the lens,* due to their extreme distance from it.

Following the laws of refraction, these rays will be refracted at their entrance into the lens, and refracted again at their emergence from it.

If we consider only two rays, L and L' in the figure, placed one above and one below the axis and at the same distance from it, we will find that, after refrection, they meet at a common point on the axis; and following the usual construction for all the other rays incident upon the first surface of the lens, we find that they all nearly meet at the same point on the axis.

In other words, all the rays parallel to the axis and incident upon the first surface of the lens, will, after refraction, converge, or concentrate at a certain point on the axis. It is this concentration of the rays that increases the brilliancy and temperature of any substance placed at this very point.

This point of convergence is called the second *principal focus,* or second *principal focal point* of the lens and is always designated by the capital letter F'. (Fig. 20.)

If we suppose now that the incident light is made to fall upon the other surface of the lens, also parallel to the axis, it is evident that the refracted rays will also converge on a point on the axis and this point is called the *first principal focal point,* which is designated by F.

It is evident that the position of the Principal Focal Points of a lens is *dependent upon the amount of the refraction* suffered by the rays of light incident upon it, consequently upon the *index of refraction* of the substance of which the lens is made, and *upon the curvature of the surfaces of the lens.*

Conjugate

Let us consider now the case in which the course of light is placed at a *finite distance* from the lens, and let us consider two rays of light emanated by a luminous point placed on the axis of the lens and in front of it. (Point A in Fig. 20), incident upon the first surface of the lens at points equidistant from the axis. The construction of the refracted rays, indicated by dotted lines in the figure, shows that their direction, after emergence from the lens, brings them to meet at a point A' which is on the axis of the lens, but *more distant from it,* than the principal focal point F'.

As all of the rays emanated from A, incident to the first surface of the lens, nearly intersect at A' after refraction, the point A' is called the *conjugate focus* of the point A. Conjugate, being a term from the Latin word *"conjugo,"* meaning "to couple."

Any luminous point placed upon the axis, in front of the lens at anay distance from it and *in front* of F, will have its *conjugate* on the axis, *behind* F'.

It is evident that, if the luminous point is placed exactly at F, it would have no conjugate, because the refracted rays would emerge from the lens parallel to the axis.

Any luminous point placed in front of the lens, at a greater distance than F, and *above* or *below* the axis, will

(Continued on Page 17)

Graininess of Motion Picture Film

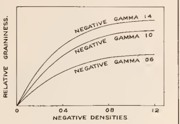
By J. I. Crabtree

Results of Projection Tests and Graininess of Duplicates Are Recounted

Figure 2

Showing arrangement of densities on a single frame of motion picture negative film for observing graininess on projection.

Right, Figure 3



From the Research Laboratory of the Eastman Kodak Company. Presented at the spring convention of the S. M. P. E., Norfolk, Va., 1927.

(Continued from Last Month)

IF MATCHED positive prints are made from negatives of the same subject developed to a low and high degree of contrast, respectively, within practical limits, there is no difference in the graininess of the images. This is because low contrast development of the negatives is offset by high contrast development of the positive.

In order to confirm further the above conclusions, and to determine the effect of printing through different negative densities (obtained by varying the exposure and degree of developmnt) on the graininess of a constant positive density obtained by a fixed degree of development, the following experiments were made.

Strips of negative motion picture film were exposed on a motion picture printer with a series of neutral density strips fitted in the gate. These consisted of gelatin containing a black dye and were entirely grainless. The density strips were so adjusted that on developing the negative to gammas (degrees of development) of 0.6, 1.0, and 1.4, respectively, the densities of the areas on each picture frame measured 0.4, 0.8, 1.2, and 1.6 respectively. This was accomplished by trial and error.

After Development

The negative frames after development appeared as in Fig. 2.

Positive prints were then made from these negatives. These prints were all given the same degree of development and the exposure was so adjusted as to give a density of 0.4 from each density strip of the negative. Referring to Fig. 2 step A was printed to a density of 0.4, then step B was printed to the same density, and so on.

The positive prints were then projected and the graininess of the various strips having a density of 0.4 were compared visually. Since the strips to be compared followed in rapid succession, a reliable comparison of graininess was possible. Three observers were employed for judging the projected prints and they all concurred in their findings. The projection tests revealed the following facts:

Results of Projection Tests

1. Maximum graininess of the positive appears in the tones having a density of about 0.4 to 0.5. This confirms the observations of Hardy and Jones.

2. Maximum graininess of the positive increases as the density of the negative increases from which it was printed. The increase is most rapid up to negative densities of around 0.8 and beyond this graininess increases only slightly. The effect is shown by the curves in Fig. 3, which are merely relative. This means that other conditions being equal, an increase in exposure of the negative, which is turn increases the density of the various tones, tends to increase graininess. This confirms the findings of Hardy and Jones.

3. In the case of a negative of given density contrast which has received a high degree of development, the maximum graininess of the positive print from this is greater than that of a similar print from a corresponding negative which received a low degree of development.

With regard to the observation above that an increase of exposure from f/11 to f/3.5 did not materially affect graininess, this would appear to be in contradiction to the results indicated by the above curves. In practice, however, owing to the limiting contrast which it is possible to obtain by over-development of positive motion picture film, it is necessary to secure a certain critical density contrast in the negative in order to obtain a satisfactory positive print even with forced development. This density contrast is of the order of 1.2, and assuming that the shadows have a density of 0.2, this means that a minimum highlight density of 1.4 is required in the negative. The above curves indicate that densities above this value do

not give appreciably more graininess in the positive so that within a practical range of exposure, over-exposure or the negative has little effect on graininess.

7. The Conditions during drying.

The experiments of Jones and Hardy[2] indicated that abnormal conditions during drying, such as prolonged drying in a humid atmosphere at relatively high temperatures did not affect graininess. It is possible, however, that under certain circumstances incipient reticulation may produce a condition resembling graininess.

Graininess of Duplicates

An increasing number of prints from duplicate negatives are being exhibited in present day theatres. Such duplicate prints are often made from projection positive prints and their graininess is usually very objectionable.

Up to within recent date it has not been possible to prepare satisfactory duplicate negatives with existing materials even when the original negative was available. If a negative is printed into regular motion picture negative film so as to produce a master positive and in turn a duplicate negative is made from this, a print from the duplicate negative is objectionably grainy. This is a result of lack of resolving power of the emulsion used or its inability to reproduce fine detail. During printing the emulsion is not able to record an image of the finest grains of the image being printed, so that each printing operation increases graininess.

Motion picture film is now available which is especially adapted for making duplicate negatives. It consists of a fine grained emulsion containing a yellow dye and has greatly improved resolving power so that the increase of graininess produced at each printing operation is reduced to a minimum. Details for handling this film have been given by Capstaff and Seymour.[7] Prints from duplicate negatives made on this material are only slightly more grainy than prints from the original negatives, and providing the original negative was developed in the borax developer above, the graininess of the print from the duplicate is no greater than that of a print from a negative developed in an ordinary developer.

It is obviously impossible to prepare satisfactory duplicate negative from a regular projection positive print. Duplicates should always be made from the original negative whenever possible. The use of special duplicating film, however, will give the best possible results if only a projection positive is available.

Practical Recommendations

Graininess in motion picture film can be reduced to a minimum by observing the following precautions:

1. Forced development of the negative should be avoided whenever possible since graininess increased as the degree of development of the negative increases. In some cases the necessity of forcing development can be avoided by employing contrasty lighting when photographing the subject so that only a relatively low degree of development is necessary to produce a negative of average density contrast.

This does not mean that negatives should be underdeveloped. If a negative of a flatly lighted subject is developed to a low degree of contrast it is necessary to force development of the positive, in which case the positive will be just as grainy as if development of the negative was forced in the first place.

2. Develop ordinary and panchromatic motion picture negative film in the following developer, which gives finer grained images than any other commercially used developer:

Fine Grain Developer for Motion Picture Film

	Metric	Avoir.
Elon	2 grams	13 oz.
Sodium sulphite (Anhy. E.K.Co.)	100 grams	41 lbs
Hydroquinone	5 grams	2 lbs.
Borax	2 grams	13 oz.
Water to make	1 liter	50 gals.

Directions for Mixing—Owing to the high concentration of sulphite in this formula, it is somewhat difficult to dissolve all the chemicals unless directions are followed carefully.

First dissolve the elon in a small volume of water (about 125°F) and add the solution to the tank. Then dissolve approximately one-quarter of the sulphite separately in hot water (about 160°F) and add the hydroquinone with stirring until completely dissolved. Add this solution to the tank. Then dissolve the remainder of the sulphite in hot water (about 160°F) add the borax, and when dissolved pour the entire solution into the tank and dilute to the required volume with cold water.

With use, this developer may become slightly muddy but this is due to a suspension of colloidal silver which is likely to form and which is harmless and may be ignored. The tank usually becomes coated with a thin white deposit of silver, but this does no harm.

The development time varies with the number of feet which have been processed but the average time for a fresh batch is from 10 to 15 minutes at 65°F. If a slower working developer is required the quantity of elon, hydroquinone, and borax should be reduced. To obtain a faster working developer, increase the quantities of these chemicals. Dilution of the developer tends to destroy its ability to produce fine grained deposits.

The life of the developer is practically the same as that of the usual motion picture developers in general use. An idea of the increase in development time with use may be gained from the fact that after 4,000 feet of film have been processed per 50 gallons of developer the development time is practically doubled.

The developer may be revived once or twice during its life by the addition of half the quantity of borax, elon and hydroquinone originally used in the formula. A trace of sulphite should be added when mixing this reviving solution to prevent oxidation of the elon and hydroquinone.

This developer is somewhat sensitive to the effect of sodium bromide produced by the conversion of the silver bromide in the processed film to metallic silver. A comparatively fresh solution is therefore necessary for de-

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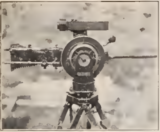
Special Device for Akeley Camera Perfected by Steene



Akeley Camera Showing Device Perfected by E. Burton Steene

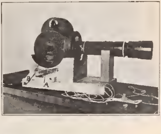
AFTER two years of experiments, E. Burton Steene, A. S. C. member and Akeley camera expert, has perfected for his Akeley a device that comprises a long sunshade bellows in which is incorporated four-way mattes, both solid and gauze; and filter and gauze matter holders for all lenses from 32mm. to 17-inch.

Steene devised and had the arrangement built to meet his own needs as an Akeley specialist in professional film production.

"The mask box," Steene stated in explaining the device, "in no way interferes with using the finder tube which is fixed on the camera for all lenses. There is an auxiliary finder, however, of the erect type, on the top of the camera, by which the image is shown right side up, left and right, and is also seen exactly as the eye sees it, or as it is seen in the original Akeley eyepiece. The finder on top is in a cradle, which is calibrated for the various focal length lenses, and by a library of masks gives the correct image for each lens. This finder is invaluable for airplane work and running inserts, heretofore the bane of all Akeley men.

"The finder," Steene continued, "can be removed, an Eyemo camera put in its place and automatically stopped and started. This gives the opportunity often to secure a double negative of the same shot. The lenses on the Eyemo match the ones used on the Akeley below it. Inasmuch as some Akeley shots are short—say 35 or 40 feet—this arrangement enables the making of two matched negatives without stopping to rewind the Eyemo."

Eyemo Camera Stand Made for Medical Research Work



THE pictures shown above represent a solid stand for the Eyemo camera, which is absolutely vibration-free, especially useful when telephoto lenses are employed. It can be placed on any flat surface or screwed on a tripod. Furthermore, it enables the operator to work the camera from a remote point by means of pulling a cord attached to level A in the picture. On loosening the cord the motor stops.

If one desires to keep the camera going continuously, the arrester, B, should be used, which keeps lever A down when once started. Thus the operator may appear in the picture from the beginning.

The stand is especially useful on explorations or for shots from dangerous angles.

The arrangement was worked out by Heinz Rosenberger, of the Micro Cinema Laboratory, of the Rockefeller Institute for Medical Research, New York City, and a member of the Society of Motion Pictures Engineers.

HOWELL
ERAS

of refinement
r productions

STERPIECES

de by accident. There is deliberate Many an artistic touch visible on gin in the conceptions of the Bell & nty years ago. The original design s. All improvements brought by time the original camera. One of the Cinemotor, which has contributed to

well Cinemotor

nts photographic artistry as a master lorings. By the simple manipulation 2 to 20 exposures per second and up- command of the cinematographer.

r direct or alternating current, 110 vibration. Hand cranking and the tely eliminated.

a may be operated by remote control. of electric extension cord.

ifications and explaining how unlim- are offered.

TOMATIC

professional camera is distinctly su- First among these is the fact that focus" or "dial iris" with camera in s are plainly visible in the spy-glass finders unnecessary. With Eyemo ht into deep shadow, making adjust- superior lens also is furnished with Hobson Cooke anastigmat in micro- for $83.00. The price of Eyemo ptive Eyemo circular detailing the

LIKE ITS PREDECESSORS

Like the B. & H Pioneer Standard Cameras which preceded it, Eyemo is designed to precision in the last detail It is thoroughly professional, with all the flexibilities required in exacting work. Fourteen lenses, each furnished with accurately matched view finder pieces, are interchangeable with the regular lens. Double and three-speed mechanism is optional. Write for fully descriptive Eyemo circular

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A PNEUMATIC FILM SQUEEGEE

(Continued from Page 8)

With the above mentioned air pressure and nozzle adjustment, the water is thoroughly removed with the film passing through the machine at a speed of two feet per second. When running at higher speeds it is necessary to increase the air pressure, but this increases the propensity of the film to vibrate rapidly between the nozzles thus increasing the possiblty of scratching. About two minutes are therefore required to transfer two hundred feet of film to the drying reel. While this is somewhat longer than is required for this operation without the use of an air squeegee, no later wiping is required, while the drying time is shortened because drying is well under way when the film reaches the drying reel. With ordinary methods drying is retarded where the film passes over the reel slats because the latter are wetted during transference of the wet film from the rack.

Measurements of the drying times for motion picture positve film at a temperature of 75°F and relative humidity 70% with cotton wiping and air squeegeeing were as follows:

	Cotton Wiping	Air Squeegeeing
Time for loading reel. . ..	2 min.	3 min.
Time for wiping film ..	2 min.	nil
Time of drying.. ..	19 min.	16 min.
Time for polishing film. .	2 min.	nil

Thus, a 25% saving of time is effected by the use of the air squeegee, while subsequent polishing of the film is unnecessary.

Air from a mechanical blower usually contains fine particles of oil in suspension. It is very necessary that the air supply should be entirely free from oil, otherwise drops of oil on the film prevent the emulsion from drying and cause crater-like markings on the surface which may be ferrotyped, due to contact with the film base when wound in the roll. They may be prevented by filtering the air supply thoroughly. A satisfactory filter for this purpose is shown in Fig. 5 This consists of a metal cylinder about 15″ long and 9″ in diameter, fitted with a coarse brass wire screen top and bottom and packed with absorbent cotton. This fits inside an outer casing, the details of which are clearly illustrated. The cotton should be renewed at frequent intervals and the filtered air supply tested before commencing work by placing a moistened cloth over the air nozzles for one minute. Any discoloration of the cloth indicates that the air has not been efficiently filtered.

In some cases two or more filters arranged in series may be necessary to completely free the air from oil.

1 Trans Soc M P Eng 17, 29 (1923); also B J Phot 71, 6, et seq (1924)

2 Trans Soc M P Eng 16, 163, (1923); also Le Phot 11 69, et seq (1924)

AMATEUR CINEMATOGRAPHY

(Continued from Page 10)

have a conjugate behind the lens, farther from it than F′, and in an inverted position in comparison of the position of the luminous point, in respect to the axis. So the conjugate of a luminous point placed *above* the axis, will be found *below* it and vice versa, the conjugate will be *above* the axis, if the luminous point is placed *below* it.

All converging lenses, bi-convex, plano-convex and convex meniscus, have two principal focal points, the first placed in front and the second placed behind it, and these points can be found by following the same reasoning and construction used for the bi-convex lens in the figure.

Divergent Lenses

ALL DIVERGENT lenses have *no real* foci, because the rays refracted by them do not converge towards the axis, but diverge from it, whatever the distance of the source of light. But if we prolong the refracted rays in a direction opposite to their path (Fig. 21) we find that their prolongation meet at a certain point on the axis, and this point is called the *virtual focus of the lens.*

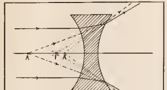

Figure 21

As in convergent lenses, the *principal focal points* are given by the refraction of rays incident upon the first surface of the lens, while traveling in a direction *parallel to the axis*, but the focal point F′ will be found *in front* of the lens, and F *behind* the lens, in an inverse position than the one they occupy in convergent lenses.

As for convergent lenses, the path of the rays emanated from any point on the axis, may be calculated and its *virtual conjugate focus* will be found to lie on the axis, between the virtual principal focus and the lens (A and A′ in Fig. 21).

A *virtual* focus will also be found by convergent lenses whenever the luminous point, source of light, is placed between the first principal focus and the axis. In such case, the refracted rays emerge from the lens *diverging* from the axis, and a *virtual* focal point will be created by their prolongation, as in the case of divergent lenses.

Points and Planes

THE location of the principal focal points can be readily located by trigonometrical calculations which involve no great difficulty and the question now arises: As the lens has a certain thickness, which is greatest at the axis for convergent lenses and least for the divergent ones, from which point of the mass of the lens shall the distance from F′ or from F be reckoned?

To the German physicist and geometrician *Gauss*, is due the remarkable theory by which a set of points and planes can be calculated for each individual lens, and for any combination of lenses.

These are called the Gauss points and planes, in honor of the discoverer of the theory.

It would be beyond the scope of these articles to attempt to give a detailed description of the fundamental principles that are the basis of the theory; we will therefore confine ourselves in the description of their position and properties.

If we consider the formation of conjugate foci, we arrive at the conclusion that if a screen is placed so as to collect the conjugate of any luminous point, we will perceive, in the case of positive lenses, on the screen the *image* of that luminous point.

If instead of a single luminous point placed in front of a convergent lens on or outside the xais, we imagine a *plane* perpendicular to the axis, it is evident that this plane can be considered as an *object* composed by an incalculable number of points, each one of which will act as a luminous point.

Each one of these luminous points will have its conjugate behind the lens, and the conglomeration of the conjugate foci will establish a plane *behind* the lens, conjugate to the plane in front of it.

The first plane is called *object plane*, and each and every one of its points is an *object point*. Its conjugate is called the *image plane* and each and every one of its points is an *image point*.

Now, the F′ point is evidently the *image point* of a luminous *object point*, placed at an infinite distance from the lens. In fact the small, extremely brilliant and extremely hot small disc which can be collected on a screen when presenting a positive lens to the sun is merely an infinitely reduced *image* of the sun itself.

Two imaginary planes, perpendicular to the axis at the F points will therefore be called the *focal planes*.

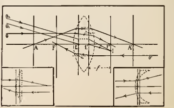

Figure 22

In Fig. 22 the planes are represented by lines perpendicular to the axis.

If we prolong one ray which is parallel to the axis and incident to the first surface of the lens (Ray O in the figure), and also we prolong its refracted ray emergent from the lens, their prolongations will meet at a certain point, which we can consider as belonging to a plane perpendicular to the axis and intersecting it at the axial point E′. The point E′ and the plane to which it is part are respectively called the *second principal point* and the *second principal plane*.

If we repeat the same construction for a ray emanated from a luminous point situated *behind* the lens (Ray O′ in the figure) we find a similar plane and corresponding axial point E, which are respectively called the *first principal plane* and the *first principal point*.

Principal points and planes can be found for all lenses, convergent or divergent (insets in Fig. 22), but their position varies according to the curvature of the surface of the lenses. In a bi-convex lens, whose radii of curvature are equal for both faces, the principal points are found to be symmetrically placed at a distance fro meach other, approximately equal to one-third of the thickness of the lens. For lenses whose faces have different curvatures, the principal points are found to be displaced toward the face of greater curvature and in some cases they may lie entirely outside the mass of the lens.

The functions of the principal points are as follows:

(a) Rays parallel to the axis emerge from the lens after refraction, *as if the original incident ray had proceeded to the farther principal plane and thence had been bent toward the focal point of the lens*. (Note in Fig. 22 the rays O and O′.)

(b) In the case of rays incident to the first surface of the lens from an infinite distance from it, and *not parallel to the axis*, it will be found that *one* ray will, after its passage through the lens, emerge from it with an inclination to the axis at an angle equal to the angle that the incident ray makes with the axis. Such ray is called a *principal ray* (Ray O_1 in Fig. 22), and it appears as if it had followed a straight path to the point E, and emerged parallel to itself but from the point E′.

A ray O_2, parallel to a principal ray, will appear as if it had followed a straight line to the principal plane E, had been transferred right across to the principal plane E′ and from this point it had joined the refracted ray O_1 at the image point I situated in the focal plane F′ of the lens.

(c) Any ray emanated from a luminous point placed *on the axis* (Ray A in the figure), will appear as having followed a straight line up to the principal plane E, having skipped straight across to the other principal plane, and thence having followed a straight line to the conjugate of the point A.

The true focal length of a lens is measured from the *principal point of emergence* to the *focal point* of the lens, and is always denoted by the small italic letter *f*. 1 II

In Fig. 22 the local length of the lens is then the distance between the point E′ and F′.

(To be Continued Next Month)

"Film Records" Will Rival Music Records is Prophesy

THE phonograph record has an ultra-modern rival for popularity in the American home in the newly developed "film records" of one hundred feet, for use with home movie projectors, according to Stephen F. Voorhees, architect of the New York Telephone Building, and vice president of the Amateur Cinema League, the non-commercial national organization of home movie makers and users.

The analogy between these short entertainment films and the familiar phonograph records is very marked, according to Mr. Voorhees. With one of the small, reasonably priced projectors in the home, corresponding to the phonograph, the private citzen can now call on Gloria Swanson, Felix the Cat or a Rocky Mountain Travelogue for entertainment, merely by placing one of the reels on the machine, just as he is now accustomed to commandeering the melody of Galli Curci of Paul Whiteman through recorded discs. Thus, in addition to their own filming, interchange of films with friends and rental pictures, home movie fans may now have their own film libraries at moderate cost, just as easily as a supply of phonograph records.

The small films run for four minutes, but can be joined together in fours to run sixteen minutes, the approximate length of a standard theatre reel. They are being produced, Mr. Voorhees reports, by the big camera and film manufacturers, by local dealers, and, most recently by the motion picture production companies, which draw on their most popular films for subject matter. Every foot of negative ever taken is a possible source for conversion to this new home consumption, he declares, so that the increasing popularity of this method of entertainment promises the ultimate creation of a tremendous variety from which the home exhibitor may draw.

Nor is the "home news reel" being overlooked, he points out. The actual films of Lindbergh's home coming reception were ready for distribution to the homes of the nation within one week of his tumultuous welcome. With the logical development of this field the time is not far distant, Mr. Voorhees prophesies, when the news of the world will be viewed in American homes in film form at the same time it is being shown in the theatres.

Gundlach-Manhattan Absorbed in Rochester Camera Merger

The plant, asset and patents of the Gundlach-Manhattan Optical Company have been bought by the Seebold Invisible Camera Corporation of Rochester, N. Y., and the two companies have been merged under the name of the latter firm, according to an announcement made last month.

The new organization will operate at the address of the old Gundlach-Manhattan company, whose lines will be continued under the merger.

GRAININESS

(Continued from Page 12)

veloping extreme under-exposures. With average studio exposures, however, excellent negatives can be obtained even with the partially exhausted developer.

3. When making duplicate negatives a minimum of graininess is insured by employing a special emulsion adapted for the purpose. Whenever possible duplicates should be made starting from the original negative and never from a projection positive unless this is the only record available.

4. Keep the camera lens clean. A dirty lens scatters light, causing lens flare. This reduces the brilliancy of the negative in the same manner as slightly fogging the negative before development. In order to offset the effect of lens flare it is necessary to force development of the negative, which in turn increases graininess.

[THE END]

New Debrie Instrument of Finder Type Is Announced

A new Debrie instrument called the Visographe is being introduced in the American market by Willoughby's of New York City.

The device is of the finder type, the purpose of which is to save the time of both director and cinematographer in ascertaining absolutely correct field and angle of the picture taken, advising what focal length lens to use, the exact proportion or dimensions of the subject to be photographed and the photographic value of colors and tones in the subject.

The instrument is made entirely of metal, the size being 75mm by 75mm by 45mm. It weighs not quite a pound. It can be carried either in the pocket or over the shoulder by a strap—like binoculars.

It is composed of two parts, forming a box. These parts are brought together or separated by a set of lazy tongs; they will indicate angles or view taken in by any motion picture lens uup to 8¾ inches. A measure on one side indicates the focal length of lens, after sighting through the back of the apparatus to ascertain the field or angle.

There is a mask slot in the center, which corresponds to all models of professional cameras. The apparatus indicates the portion of the picture affected by masks employed.

To assist in determining photographic values of colors and tones in the subject, a blue-green glass is conveniently located to pull down over the eyepiece.

PROJECTION—Conducted by Earl J. Denison

Good Prints for Long-run Theatres

By Daniel B. Clark, A. S. C.

POSSIBLY the original urge which established the institution of "first nighters" in legitimate theatres was the desire, on the part of dramatic connoisseurs, to view a presentation in all of its pristine spontaneity, rather than a jaded performance which players are wont to offer on the fag end of a long run of any vehicle.

Film Theatres

Does the same condition sometimes obtain in motion picture theatres which have a policy of lengthy engagements?

Standard Falls

My point is simply this: If a production has been running several weeks or months, through continuous performances, very often the print arrives at such a condition where the images, as viewed on the screen, certainly do not represent the high standard of screening which attended the first night exhibition of the film.

Strain Tells

With one print in continuous use during such a long run, it attains, in a concentrated period of time, an oldage which, in general exhibition, could only be reached in a couple of years. The care of the projectionist may be the best, and the projector may be working in perfect order; but if the preparation of the print has been faulty in the least, the strain soon begins to tell.

Special Prints

In New York and Los Angeles, many of the long-run houses have prints especially prepared for their own use; and, because of this extra preparation, those in command are loathe to furnish another print if the special print begins to show signs of wear.

Withstand Wear

Therefore, it behooves the producer and the distributor to use every means known to furnish such houses with a print, which not only meets their own conditions but which will stand up under the most exacting wear.

Worn-Out Positives Injure Performances; Ventilation in Projection Rooms Needed

Ventilation

WITH the heavy hand of summer heat on Eastern and Middle Western communities, the matter of ventilation for projection rooms is more vital than ever.

Personal Discomfort

Many designers of theaters, still actuated by the rules of the days of projection "booths," have not been generous in laying out the compartments wherein the projectionists preside at their calling. The result is cramped quarters, and a great degree of personal discomfort.

Air Circulation

If, in such places, the projectionist cannot be given more elbow room, he certainly should enjoy the advantages of adequate ventilation. The theatre itself lists ample ventilation among its prime necessities; many houses in fact make an advertising feature of their systems of ventilation—when, on the same premises the projectionist may be perspiring away to the point of melting.

There are efficient means of ventilation for the projection room just as there are for the theatre itself. The cost of installation should not be a hindrance, and the welfare of the projectionist certainly deserves this consideration.

New Colors for Tinting Films Announced by du Pont Company

The Dyestuffs Department of E. I. du Pont de Nemours & Company announces the introduction of an entirely new line of spirit soluble colors, which they are placing on the market under the name of Luxol Colors.

From among them, a range of the colors desired for tinting photographic films has been selected.

The outstanding features of this series of colors are their high solubility, exceptionally good fastness to light and the wide range available.

The Luxol colors are soluble in methyl and ethyl alcohol. They are also soluble in pyridine, furfural, diacetone-alcohol; a few are even soluble in acetone.

Creco Physicist Discusses Incandescent Lamp Problems

DISCUSSING "The Incandescent Lamp Situation," Fred McBan, physicist of the Creco Research Department, Hollywood, dwells on a number of practical details which have been revealed in the experiments of his organization. Mr. McBan's discussion follows:

"In order that the filament in the lamp will not oxidize and burn, it is placed in a bulb in which all air has been removed. A method of preventing oxidization is to replace the air in the bulb by inert gas. To summarize an incandescent lamp: It is essentially a filament of some material that is able to light by its being heated to incandescence by an electric current. To prevent this filament from oxidizing or burning up, it is operated either in a vacuum or in an atmosphere of inert gas, notably hydrogen. In a vacuum a filament suffers by reason of the absence of pressure to hold it together and counteracts the tendency for it to vaporize. This difficulty can be overcome by the use of gas in the bulb, which permits operating the filament at a higher temperature without causing undue vaporization. However, disadvantage results in the form of heat losses through the path provided by the gas in the cast of straight filament; but with a closely coiled filament the loss is small enough so that in many cases it does not offset the gain in efficiency resulting from higher filament temperature.

"With the development of the helically coiled filament it was found that the reduction in the rate of evaporation of the filament permitted operation at a temperature which increased the volume of light to an extent that more than offset the disadvantage of increased energy loss through conduction and convection by the gas, convection in this particular case meaning the transmitting of heat by gas. This conduction and convection loss is nearly independent of the diameter of filaments of commercial size, and hence in lamps designed for a definite voltage, those of the higher wattage are the more efficient in lighting values.

"The gas in the bulb of this type of lamp furnishes a pressure about the filament corresponding approximately to atmospheric pressure, and thus it greatly reduces the tendency of the filament to vaporize or disintegrate. In the case of a filament operating in a vacuum the condition is reversed, the basis of pressure favors the disintegration of the filament, with the result that the filament cannot be satisfactorily operated at as high a temperature as in gas. It was pointed out that one of the reasons for not using an inert gas in the bulb in the earlier lamp was the fact that this gas conducted the heat of the filament away very rapidly. The coiled filament made it possible to concentrate the filament into a small space at the center of the bulb, so that its surface was much less freely exposed to the surrounding gas, and the heat loss through the gas was thus greatly reduced. The principle is the same as that

which makes it possible for a herd of cattle to keep warm on a cold day by huddling together, thereby reducing the total surface of the mass exposed to the elements or weather conditions.

"Another factor that we have to take into consideration is the breakage, or the fragility of the lamps. The physical liquidification point of tungsten is 3,400C or 6,152F, yet the lamp must reach this figure to operate at the full light efficiency. It follows from this that the nitrogen gas jacket around the tungsten filament must act as a shock absorber to take care of the vibration that will happen when moving on with the sets made necessary for lighting effects.

"I feel at this time that some form of filter may be necessary to choke back the infra red rays that we know to exist in the case of incandescent lamp. I especially refer to the 3KW, 5KW and 10KW lamp now advocated for studio use.

"The higher the operating temperature of gas-filled lamps also accounts for an advantage in the color quality of the light. In general, as the temperature of a solid is increased, the color of the light it emits grows whiter. A tungsten filament lamp of the vacuum type gives a whiter light than the carbon filament, primarily because it operates at a higher temperature. In the same way the tungsten filament in a gas-filled lamp gives a still whiter light because of the higher operating temperature made possible with the use of gas in the bulb. Even the light of gas-filled tungsten lamps, however, is not as white as average daylight, primarily because they operate at far less than sun temperature. Where it is desired to produce light approaching daylight in color quality, so as to cause colors to appear approximately the same as they do under daylight, the light may be filtered through blue-green glass. The blue glass, if it is of proper color content, will screen out the excess of red and yellow rays with the result that while the total amount of light is reduced, its color quality is much nearer to that of sunlight.

"Yet another angle is that of psychology. Most of us feel that red heat which the incandescent lamp is very strong in, is hotter than white, green, or blue heat, in the case of the carbon arc.

"To sum up the individual merits of the incandescents, as against that of the carbon, needs considerable thought at this time, but since we of the motion picture business usually solve our own problems without outside technical aid, I don't think that we will lose any sleep on this."

Whitman Assigned to Direct "Smith Family" Comedy Series

Philip H. Whitman, A. S. C., who was recently promoted to directorship at the Mack Sennett studios, is directing the "Smith Family" series which is being released by Sennett through Pathe.

Whitman, a veteran cinematographer, was in the scenario department at Sennett's before being elevated to the directorial post.

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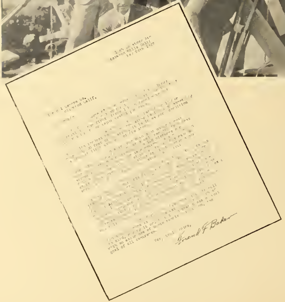

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